



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



PAUL R. LEPAGE
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COMMISSIONER

**Westbrook Energy Center, LLC
Cumberland County
Westbrook, Maine
A-743-70-G-A**

**Departmental
Findings of Fact and Order
Part 70 Air Emission License
Amendment #1**

FINDINGS OF FACT

After review of the Part 70 license amendment application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A, §344 and §590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Westbrook Energy Center, LLC (Westbrook Energy Center)
LICENSE TYPE	06-096 CMR 140, Part 70 Significant License Modification
NAICS CODES	22112
NATURE OF BUSINESS	Fossil Fuel Electric Power Generation
FACILITY LOCATION	60 Eisenhower Drive, Westbrook, ME

Westbrook Energy Center is a natural gas fired combined cycle plant with two combined cycle systems used to produce market electricity. Each combined cycle system consists of a gas combustion turbine and an unfired heat recovery steam generator (HRSG). The steam produced in the HRSG is routed to a steam turbine.

The facility is an existing stationary source currently operating under the Part 70 license A-743-70-D-R, issued on June 9, 2015, and amendments issued under the New Source Review program (06-096 CMR 115, *Minor and Major Source Air Emission License Regulations*, as amended). Westbrook Energy Center is considered a Part 70 major source as defined in 06-096 CMR 100, *Definitions Regulations*, (as amended).

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B. Amendment Description

Westbrook Energy Center submitted a Part 70 amendment application to incorporate the New Source Review air emission license amendment A-743-77-3-A into the Part 70 license.

New Source Review air emission license amendment A-743-77-3-A, processed as a minor modification under 06-096 CMR 115 (as amended), includes the following:

- clarification of the startup, shutdown, and runback lb/hr license emission limits and associated averaging times for nitrogen oxides (NO_x) and carbon monoxide (CO) from the two combustion turbines, and
- a request to reinstate a revised condition from the original Part 70 license for electricity supply emergency scenarios.

The current lb/hr limits during startup, shutdown, and runback events were based on a 24-hour block average in which these events occurred, including non-operating and operating times. Westbrook Energy Center submitted adjusted short term startup, shutdown, and runback emission limits based on 1-hour averaging times for CO and NO_x, utilizing a more appropriate method of calculating the emissions from these events reflecting combustion turbine operations. Actual emissions from the facility are not expected to change, only the calculation method. All other combustion turbine emission limits and averaging times will remain as currently licensed, including short term emission limits during steady state operations and facility tons/year emission limits.

This Part 70 Significant Modification incorporates the New Source Review air emission license amendment into the Part 70 license by revising the startup, shutdown, and runback combustion turbine lb/hr emission limits and associated averaging times for NO_x and CO; as well as adding a condition to restrict the facility when utilized in an electric supply emergency to the startup, shutdown, and runback emission limits. Both this Part 70 amendment and A-743-77-3-A have been processed simultaneously.

C. Emission Equipment

This amendment addresses the following existing equipment:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (Mscf/hr)	Fuel Type	Date of Manufacture	Date of Installation	Stack #
Combustion Turbine #1	2,013*	2,013	Natural gas	2000	2000/2001	1
Combustion Turbine #2	2,013*	2,013	Natural gas	2000	2000/2001	2

* Maximum design heat input is based on each unit operating at base load with an ambient temperature of -20 °F and firing natural gas at a higher heating value of 1,000 Btu/scf.

D. Application Classification

Based on changes to the startup, shutdown, and runback events lb/hr licensed emission limits and averaging times, the application to incorporate the New Source Review requirements into the Part 70 license is not considered a Part 70 Administrative Revision or Part 70 Minor License Modification and has been classified and processed as a Part 70 Significant License Modification under 06-096 CMR 140, *Part 70 Emission License Regulations*.

II. PART 70 SIGNIFICANT LICENSE MODIFICATION DESCRIPTION

A. Overview

Westbrook Energy Center operates two General Electric Model MS7001FA combustion turbines with fourteen natural gas burners each, dry low NO_x (DLN) combustors, and a selective catalytic reduction (SCR) system. The facility operates under a Part 70 license renewal and New Source Review amendments.

Westbrook Energy Center submitted an air emission license amendment application to address the combustion turbines' startup, shutdown, and runback events and electricity supply emergency scenarios, with the request that the 06-096 CMR 115 New Source Review minor modification amendment and the Part 70 Significant Modification amendment be processed simultaneously. The amendment application included a BACT analysis and an ambient air quality modeling analysis. The BACT and modeling analysis information is included in the New Source Review license amendment A-743-77-3-A.

B. Combustion Turbines #1 and #2: Startup, Shutdown, and Runback Events for NO_x and CO

Combustion Turbines #1 and #2 fire natural gas only and are each rated at 2,013 MMBtu/hr. The two General Electric Model number MS7001FA units are equipped with dry low NO_x combustors and a selective catalytic reduction (SCR) system to control NO_x emissions. Each unit exhausts through a separate 165 foot stack.

The combustion turbine operations at Westbrook Energy Center are licensed to operate at steady state, but also have specific emission limits for startup, shutdown, and runback events. Hourly emissions rates of NO_x and CO are typically higher during periods of startup, shutdown, and runback due, in general, to the combustion turbine's dry low NO_x system not being in full operational mode, the NO_x emissions not being controlled by the selective catalytic reduction (SCR) system, and the combustion turbine not operating at full load where it is most efficient. When the combustion turbine exhaust gas is below the minimum catalyst activation temperature, the control system does not permit the flow of ammonia and therefore the SCR does not function during these events.

Startup and shutdown events consist of specific steps to thermally stabilize the combined cycle combustion turbine unit during start up or shut down to ensure safe, efficient, and proper operation. Combined cycle units have different startup times depending on how long the unit has not been operating (standstill time). The periods of startup are referred to as cold, warm, or hot starts. The combustion portion of a combined cycle unit is not as affected by the duration of standstill time as the heat recovery steam generator (HRSG) and steam turbine. The steam turbine contains components with metallurgical properties that need to heat up properly to avoid thermal stress on the equipment. Westbrook Energy Center's startups are defined as the period of time from initiation of combustion turbine firing until the unit reaches steady state load operation, not to exceed a time period of 300 minutes. Shutdown occurs by reducing gas combustion loads and then shutting down the steam turbine when exhaust gas temperature reaches a minimum level, followed by full reduction of fuel. Westbrook Energy Center's shutdowns are defined as the period of time from steady state operation to cessation of combustion turbine firing, not to exceed a time period of 60 minutes.

A runback event is when a combustion turbine, without warning, automatically initiates a shutdown and drops out of Mode 6Q (which 6Q is the mode in which the combustor dynamics are optimum). When out of Mode 6Q, the selective catalytic reduction (SCR) equipment is not operational and the dry low NO_x system is not fully operational. A combustion turbine runback is the time during which a combustion turbine is returned to steady state operations after the

initiation of an unplanned shutdown. Runback events are not common, but do occasionally occur.

NO_x and CO emissions can be highly variable during these events and are greater than emission rates during steady state operations because the emission control systems are not functional or are only partially functional during startup, shutdown, and runback time periods due to the temperature and operating rates during the events. The combustion turbines are also not operating at full load where operations are most efficient. The combustion turbines must achieve a minimum operating rate before the dry low NO_x combustor systems are fully functioning. The SCR systems must be heated to a specific minimum temperature before the catalyst becomes effective.

Westbrook Energy Center proposed to clarify and adjust the licensed NO_x and CO emission limits during the startup, shutdown, and runback events, based on a shorter averaging time than previously utilized. A 1-hr average was proposed as compared to the current 24-hour average. The emissions limits under steady state operation and the facility's tons/year emission limits remain as licensed.

Startup, shutdown, and runback periods are defined in the Part 70 license A-743-70-D-R (issued June 9, 2015) for a specified short period of time such that the current 24-hr block average is not an appropriate averaging time to be used during these events. The Part 70 license defines a turbine startup as being completed as soon as practicable, in no case exceeding 300 minutes (5 hours), and turbine shutdown and runback events are each not to exceed 60 minutes (1 hour). A 1-hour averaging time is more practical for these events, particularly since NO_x and CO have 1-hour National Ambient Air Quality Standards. Because the 1-hr averaging time is a much shorter time period than the existing 24-hour average and will not include hours during steady state operation or when the unit is offline, the emission limits are higher. The proposed startup, shutdown, and runback emission limits for NO_x and CO were developed based on a review of Westbrook Energy Center's actual turbine emission data. Actual emissions are not expected to change with the proposed emission limits which were based on the 1-hour averaging time.

The current license emission limits set forth in Condition (15)(D)(2) of Part 70 license A-743-70-D-R and the emission limits and averaging times established through A-743-77-3-A are listed in the table below.

Startup, Shutdown, and Runback Limits for Each Combustion Turbine

Pollutant	Current Part 70 License Limit (lb/hr)	Current Averaging Time	Revised Limit (lb/hr)	Revised Averaging Time
NO _x	160	24-hr block avg [*]	360	1-hr block avg
CO	200	24-hr block avg [*]	2000	1-hr block avg

* For the purposes of calculating startup and shutdown lb/hr during the startup and shutdown conditions, 24 hours shall be defined as the period between 12:00am and 11:59pm during which startup(s) and/or shutdowns have taken place.

Any hour with startup, shutdown, or runback minutes will be classified as such and the startup, shutdown, or runback emission limits proposed in the table above will apply. Any hour with startup, shutdown, or runback minutes will not be included in the averaging time calculations for steady state operation. Consistent with 06-096 CMR 117, Section (3)(C)(2)(a), a valid hour for demonstrating compliance with short term startup, shutdown, and runback emission limits is defined as an hour that contains at least one data point in at least three of the four 15 minute quadrants.

Westbrook Energy Center follows detailed procedures for combustion turbine operation during startup and shutdown events as specified by the manufacturer, minimizing emissions from the combustion turbines to the maximum extent practicable. Minimizing time operating in startup, shutdown, and runback modes through good combustion practices and good engineering and operating practices in accordance with manufacturer's recommendations was considered to be an appropriate control method for these combined cycle units.

For startup, shutdown, and runback events, based on the good combustion practices and manufacturers recommendations, review of operational data, and the results of an Ambient Air Quality Impact Analysis, Westbrook Energy Center shall be limited to NO_x emissions of 360 lb/hr on a 1-hr basis and CO emissions of 2000 lb/hr on a 1-hr basis during startup, shutdown, and runback events for each combustion turbine.

The clarification of startup, shutdown, and runback emission limits and averaging times do not constitute a modification since actual emissions, the method of operations, and licensed allowed annual facility emissions are not changing.

C. Electrical Supply Emergency Condition

Due to its geographical location in the regional electrical grid and its power generating capabilities, Westbrook Energy Center may be required by

Independent System Operator- New England (ISO-NE) to operate at low loads in the event of an ISO-NE electrical supply emergency. An ISO-NE electrical emergency is generally defined as a wide-spread electrical outage or blackout and, although rare, it can occur if multiple reliability safeguards break down. Requiring Westbrook Energy Center to operate below normal operating loads to provide electrical load back to the grid and help establish grid stability after these potential emergency electrical supply blackouts is more environmentally beneficial than operating many small emergency diesel generators throughout the state to provide the power necessary to bring the grid back up.

In the initial Part 70 license (A-743-70-A-I, issued August 12, 2003), condition (15)(M) addressed electrical supply emergency scenarios, but was not included in the subsequent renewal because the language did not specify emission limits during the events. The following wording was in the initial Part 70 license:

(15)(M) The emission limits contained in this permit do not apply if the facility, during an electricity supply emergency, is directed by Independent System Operator - New England (ISO-NE) to operate at low loads such that the SCR cannot operate due to unstable temperatures. During such operation, Calpine will use its best efforts to minimize air emissions, and shall operate the SCR as soon as it is practical once temperatures stabilize.

EPA does not allow for blanket exemptions from emission limits, and, therefore, the condition was not incorporated into the Part 70 license renewal; however, Westbrook Energy has proposed a revised condition for these emergency scenarios. The proposed condition is as follows:

The NO_x and CO emission limits (ppm and lb/hr) for steady state load operation contained in this license do not apply if the facility, during an electricity supply emergency, is directed by Independent System Operator - New England (ISO-NE) to operate at low loads such that the SCR cannot operate due to unstable temperatures. During such operation, the NO_x and CO lb/hr limits for startup, shutdown, and runback events shall apply.

The Department approved the proposed license language to address the electrical supply emergency scenarios in A-743-77-3-A. Steady state operation emission limits would not apply and the appropriate approach to minimize emissions during the low load operation is utilizing good engineering and operating practices in accordance with manufacturer recommendations, as detailed in the discussion on startup, shutdown, and runback events.

D. Facility Annual Emissions

Annual licensed emissions are not changing with this amendment. Westbrook Energy Center is licensed for the following annual emissions, based on a

12-month rolling total. The tons per year limits were calculated based on license limitations on the combustion turbines, the auxiliary boiler fuel limit of 98 MMscf/year, the Emergency Generator non-emergency operational limit of 100 hours/year and the Fire Pump non-emergency operational limit of 100 hours/year.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	PM ₁₀	SO ₂	NO _x	CO	VOC	NH ₃
Combustion Turbines #1 and #2 (total)	36	26	90	137	525	26	188
Auxiliary Boiler	0.49	0.49	0.05	1.72	7.41	0.98	--
Emergency Generator	0.04	0.04	negl	1.28	0.34	0.03	--
Emergency Fire Pump	0.02	0.02	negl	0.70	0.15	0.01	--
Cooling Tower	12.3	12.3	--	--	--	--	--
Total TPY	48.9	38.9	90.1	140.7	532.9	27.0	188

Westbrook Energy Center is an area source for hazardous air pollutants; therefore HAP emissions shall not exceed the following:

Pollutant	Tons/year
Single HAP	9.9
Total HAP	24.9

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that emissions from this source:

- will receive Best Practical Treatment;
- will not violate applicable emissions standards; and
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants the Part 70 License A-743-70-G-A pursuant to 06-096 CMR 140 and the preconstruction permitting requirements of 06-096 CMR 115 and subject to the conditions found in Air Emission License A-743-70-D-R and the following conditions.

Federally enforceable conditions in this Part 70 license must be changed pursuant to the applicable requirements in 06-096 CMR 115 for making such changes and pursuant to the applicable requirements in 06-096 CMR 140.

For each specific condition which is state enforceable only, state-only enforceability is designated with the following statement: **Enforceable by State-only.**

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

SPECIFIC CONDITIONS

The following shall replace condition (15)(D) in air emission license A-743-70-D-R (issued August June 9, 2015):

(15) **Combustion Turbine #1 and #2**

D. Combustion Turbines #1 and #2 Emission Limits

1. Emissions from Combustion Turbines #1 and #2 shall each not exceed the following concentration emission limits, except during turbine startup, shutdown, and runback events:

Combustion Turbines #1 and #2			
Pollutant	Emission Limit	Averaging Time	Origin and Authority
NO _x	2.5 ppmdv @ 15% O ₂	3-hr block avg	A-743-71-A-N (12/4/1998), LAER and A-743-77-1-A (11/3/2010), BACT
CO	15 ppmdv @ 15% O ₂	24-hr block avg	A-743-71-A-N (12/4/1998), A-743-77-1-A (11/3/2010), and A-743-77-2-A (8/14/2013), BACT
NH ₃	10 ppmdv @15% O ₂	30-day rolling avg	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT
	20 ppmdv @15% O ₂	24-hr block avg	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT

2. Emissions from Combustion Turbines #1 and #2 shall each not exceed the following mass emission limits:

Combustion Turbines #1 and #2			
Pollutant	lb/hr	Averaging Time	Origin and Authority
PM	22	-	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT
PM ₁₀	22	-	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT
SO ₂	12	-	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT
NO _x	18 (steady state operations, excluding startup, shutdown, and runback events)	1-hr block avg	A-743-71-A-N (12/4/1998), LAER and A-743-77-1-A (11/3/2010), BACT
	360 (startup, shutdown, and runback events)	1-hr block avg*	A-743-77-3-A, BACT
CO	53 (steady state operations, excluding startup, shutdown, and runback events)	1-hr block avg	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), and A-743-77-2-A (8/14/2013), BACT
	2000 (startup, shutdown, and runback events)	1-hr block avg*	A-743-77-3-A, BACT
VOC	3	-	A-743-71-A-N (12/4/1998) and A-743-77-1-A (11/3/2010), BACT
NH ₃	27	-	A-743-77-1-A (11/3/2010), BACT

- * For the purposes of calculating startup, shutdown, and runback lb/hr, any hour with startup, shutdown, or runback minutes will be classified as such and the startup, shutdown, or runback emission limits proposed in the table above will apply. Any hour with startup, shutdown, or runback minutes will not be included in the averaging time calculations for steady state operation. A valid hour for demonstrating compliance with short term startup, shutdown, and runback emission limits is defined as an hour that contains at least one data point in at least three of the four 15 minute quadrants.

3. Visible emissions from each of the combustion turbines shall not exceed 20% opacity on a six-minute block average basis, except for one six-minute period per hour of not more than 27% opacity, including during startup and shutdown periods. [A-743-77-1-A (11/3/2010), BACT]

The following is a new condition:

(32) ISO-NE Electrical Supply Emergency

Combustion Turbines #1 and #2 licensed NO_x and CO emission limits (ppm and lb/hr) for steady state load operation do not apply if the facility, during an electricity supply emergency, is directed by Independent System Operator - New England (ISO-NE) to operate at low loads such that the SCR cannot operate due to unstable temperatures. During such operation, the NO_x and CO lb/hr limits for startup, shutdown, and runback events shall apply to each combustion turbine. [A-743-77-3-A]

DONE AND DATED IN AUGUSTA, MAINE THIS 5 DAY OF April, 2016.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:


PAUL MERCER, COMMISSIONER

The term of this amendment shall be concurrent with the term of Air Emission License A-743-70-D-R.

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of the most recent application: October 27, 2015

Date of the most recent application acceptance: October 30, 2015

Date filed with the Board of Environmental Protection:

This Order prepared by Kathleen E. Tarbuck and Edwin L. Cousins, Bureau of Air Quality.

